Lessons from practice

Asbestosis in an Australian brake mechanic

Clinical record

A 76-year-old man presented with progressive breathlessness and dry cough. He was an ex-smoker (ten pack-years) and had worked as a motor mechanic for over 40 years. Detailed occupational history revealed exposure to asbestos between 1969 and 2011, primarily while grinding and cutting asbestos brake linings and clutch plates. He used a compressed air hose to clean off the brake shoes once old linings had been removed, generating clouds of fine respirable asbestos dust. Examination revealed no fingernail clubbing, and oxygen saturation was 96% on room air. Bilateral persistent late inspiratory crackles were audible at the lung bases, with normal cardiovascular examination. Breathlessness was first noticed in 2007, with lower zone interstitial pulmonary fibrosis described on imaging then.

High resolution computed tomography (CT) scan showed usual interstitial pneumonia (UIP) type pattern fibrosis, with areas of confluence at the right base (Box). Small pleural plaques were observed. Lung function showed a restrictive pattern with forced vital capacity (FVC) 2.45 L (55% predicted) and total lung capacity (TLC) 4.23 L (60% predicted). Gas transfer was 10.8 (38% predicted).

Discussion

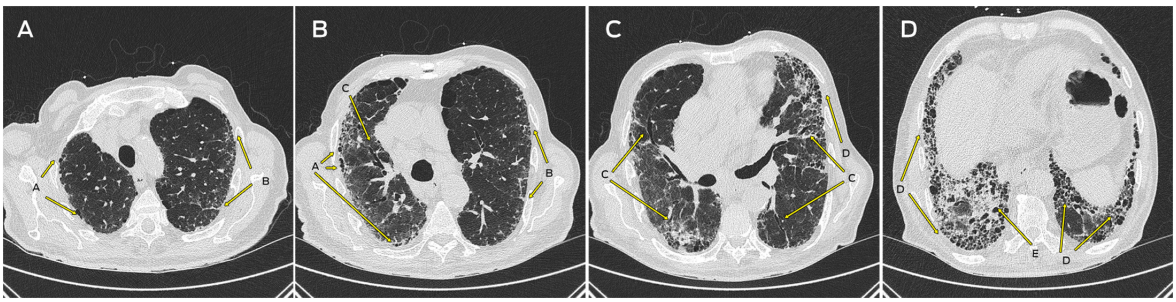
Asbestos-related disease includes interstitial pulmonary fibrosis arising from asbestos exposure (asbestosis), pleural plaques and diffuse pleural thickening, benign pleural effusion, mesothelioma and lung cancer. Asbestosis and idiopathic pulmonary fibrosis are radiologically similar, with imaging showing a UIP pattern fibrosis, and diagnosis relies on a detailed occupational history, with supportive radiological findings such as pleural plaques (although these are not always present). Asbestos-related disease in brake workers has been much debated.[1]

Car mechanics working from the 1970s to the 1990s were frequently exposed to chrysotile asbestos from grinding brake linings and replacing clutches while servicing cars and trucks. Asbestos exposure is well documented in car mechanics both in Australia and internationally,[2-5] but levels were thought too low for the development of asbestosis. In addition, chrysotile is altered in the braking environment, converting it to forsterite, decreasing toxicity of the inhaled dust. Relative toxicity is probably also changed by physical factors such as binding of resin matrix to the fibre surface.[6] Use of asbestos in brake and clutch components was prohibited from 1999 in Australia, with a full ban in 2003. Thus, vehicles manufactured before then may still have asbestos-containing brake shoes.

Reports have described asbestosis in mechanics,[7] but, to our knowledge, not in the Australian medical literature. Several international case series[1] and larger studies[6,8] described interstitial abnormalities in brake mechanics.[1] The incidence of asbestosis was not raised in motor mechanics in early studies;[9] these are now historical and did not employ sensitive techniques such CT scans, which are now the standard investigation for asbestos-related disease.

Several recent studies confirm that chrysotile can be released from brake maintenance activities in levels exceeding occupational exposure limits.[1,6,8,10] Car mechanics have also been documented to have increased asbestos lung fibre concentrations compared with controls. Long term follow-up studies confirm that asbestosis can indeed occasionally occur in car mechanics.[6] Over the years, new cohort studies and re-analyses of old studies have demonstrated a decrease in estimated cumulative exposure, but also that such exposures are capable of causing asbestosis, with a cohort study of asbestos cement workers finding a few asbestosis-related deaths at cumulative exposure levels below five fibres per cm^3 per year.[8]

Axial sections of high resolution computed tomography scans from the patient



Panels **A**, **B**, **C** and **D** demonstrate axial slices in an apicobasal progression. As we progress from panel **A** where there are predominantly subpleural cysts (a) and subpleural septal thickening (b), we note the development of traction bronchiectasis (c), fibrosis with subpleural cystic spaces and probable honeycombing (d), and areas of confluent opacity/fibrosis (e). At the apices in panel **A**, the findings are milder than at the costophrenic angles in panel **D**, where there are extensive honeycombing changes with areas of confluent fibrosis. Within these panels, the arrows denote findings (a) subpleural cysts, (b) subpleural septal thickening, (c) traction bronchiectasis, (d) fibrosis with subpleural cystic spaces and probable honeycombing, and (e) confluent fibrosis. ◆

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Recently, a 45-year nationwide Danish cohort study[6] has shed further light on this debate. The study used population-based databases with access to all people who were skilled workers and apprentices in Denmark in the 1970s. The study used prospectively collected medical data, including all hospital contacts, development of malignancy, and deaths, aiming to examine the incidence of mesothelioma and asbestosis in brake mechanics. The study compared 138 589 motor vehicle mechanics with over one million matched control workers, and potential confounding factors were carefully controlled for including smoking and disease latency. It found an increased risk of asbestosis (hazard ratio, 1.79; 95% confidence interval, 1.10–2.92), with no increased risk of mesothelioma. Forty-seven cases of asbestosis were observed in vehicle mechanics. The Danish study stated that "The 1970 vehicle mechanics cohort showed an excess of inpatient asbestosis beginning in the mid-1980s and an abrupt increase in outpatient asbestosis beginning in the mid-2000s. There was no similar pattern for other outcomes (mesothelioma, lung cancer, lung disease due to other external agents and [chronic obstructive pulmonary disease])".[6] This is the largest and most robust epidemiological study on asbestos-related diseases in motor mechanics. Despite some unexpected discrepancies in results, it confirms that although rare, asbestosis can result from such exposure. The latency of exposure in this study is almost identical to that of our patient. We believe that our patient developed asbestosis from exposure to chrysotile brake linings, representing, to our knowledge, the first documented Australian case.

Patient consent: The patient provided written consent for publication.

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Lessons from practice

- Brake mechanics were formerly exposed to variable levels of chrysotile asbestos. In Australia, despite a ban on asbestos-containing brake components in the late 1990s, a full ban was not introduced until 2003.
- Asbestosis (diffuse interstitial pulmonary fibrosis due to asbestos inhalation) may be clinically indistinguishable from idiopathic pulmonary fibrosis, and requires relatively heavy exposure to asbestos compared with other types of asbestos-related disorders.
- Asbestosis is rare in brake mechanics, but a recent study has confirmed that this can rarely occur in motor vehicle repairers exposed between the 1970s and early 2000s.
- Although such cases should occur in reducing frequency, physicians should be aware of the possibility of asbestos-related diseases in motor mechanics exposed before the early 2000s. A detailed occupational history is essential to identifying potential causative factors in patients presenting with pulmonary fibrosis.

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